

INVESTIGATION OF THE CHEMICAL LITERATURE

BY

F. E. BARROWS

ARMOUR INSTITUTE OF TECHNOLOGY

1919

540.04
B 27



Ministry of Technology
UNIVERSITY LIBRARIES

AT 504

Barrows, Frank E.

Investigation of the
chemical literature

Digitized by the Internet Archive
in 2009 with funding from
CARLI: Consortium of Academic and Research Libraries in Illinois

THESIS

INVESTIGATIONS OF THE CHEMICAL LITERATURE

by

Frank E. Barrows.

ILLINOIS INSTITUTE OF TECHNOLOGY
PAUL V. GALVIN LIBRARY
35 WEST 33RD STREET
CHICAGO, IL 60646

Armour Institute of Technology,

May, 1919.

1911

THE CHICAGO TRIBUNE

CHICAGO, ILL., MONDAY, JANUARY 2, 1911

CHICAGO, ILL., MONDAY, JANUARY 2, 1911
RECEIVED
JAN 2 1911
CHICAGO, ILL.

THE CHICAGO TRIBUNE

INVESTIGATIONS OF THE CHEMICAL LITERATURE

<u>Index</u>	Page
Introduction	3
The Field of Chemical Literature	
Periodicals	3
Other Literature	4
Various Fields of Chemistry	5
Various Kinds of Searches or Investigations	6
Libraries	8
Card Index Catalogues	10
Shelf Lists	12
General Reference Works	14
Dictionaries	15
Encyclopedias	15
Hand-Books	16
Gmelin's Hand-Book of Chemistry	16
Gmelin - Kraut	19
Other Handbooks and Treatises	20
General Reference Works, Organic Chemistry.	21
Bolton-Select Bibliography of Chemistry ...	23
Catalogue of Scientific Papers	26
International Catalogue of Scientific Literature	29
Repertorium der Technischen Journal Literatur	31
The Industrial Arts Index	32
Mining World Index	33
Engineering Index	33
Public Documents	34
Periodicals	36
Check Lists of Periodicals	47
Patents	51

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

The Patent Literature	52
Obtaining Copies of Publications and Patents	65
Importance of Providing Better Facilities for Investigating and Using the Chemical Literature	65
Training in the Use of Chemical Literature	67

21 entered in the list

22 containing copies of the

23 of the

24 of the

25 of the

INVESTIGATIONS OF THE CHEMICAL LITERATURE

INTRODUCTION

The Chemical literature is the storehouse of the available published information of chemical science and chemical industry. It is most extensive, both in the wide range of subjects which it includes and in the long period of time over which it extends. Investigations of this literature are often required. Proper investigation requires a familiarity, on the part of the investigator, with the various sources of information and with the facilities available for using them. The importance of proper training and guidance in making investigations of the chemical literature is not as generally recognized as it should be.

The present paper is a contribution to the general subject of the chemical literature and its investigation, and includes a discussion of the use of library facilities and general reference works, and of the searching of the periodical, and other literature.

THE FIELD OF CHEMICAL LITERATURE

Periodicals

The number of current periodicals systematical-

THE [illegible] OF [illegible]

[illegible]

BY [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

ly examined for "Chemical Abstracts", according to the list published in 1918, was 789. Bolton, in his "Select Bibliography of Chemistry", published in 1893, lists 436 periodicals, while in his "Catalogue of Scientific and Technical Periodicals, 1865-1895", published in 1879, he gives the following numbers of periodicals as relating to certain branches of chemistry, - General Chemistry - 154; Pharmaceutical Chemistry - 30; Physiological Chemistry - 6; Technical Chemistry - 94; Dyeing and Printing - 21; Illuminating Gas - 30; Iron Industry - 33; Keramics and Glass - 32; Metallurgy - 44; Mining - 165; Oils, Fats, Soap, etc., - 22; Sugar - 43; Tanning and Leather - 11; Wines and Spirits - 48. Even as early as 1848, Gmelin, in Vol. 1 of his "Hand-Book of Chemistry", gives a list of 77 chemical periodicals of earlier date.

Other Literature

In addition to the periodical literature, the field of chemical literature also includes the patent literature, the text-book literature and the numerous histories, hand-books, dictionaries, encyclopedias, technologies, pamphlets, bulletins, monographs, dissertations, public documents, trade catalogues, reviews, indexes, bibliographies, and other books and publications which

relate, in whole or in part, to chemical science or to chemical industry.

Various Fields of Chemistry

Within the general field of the chemical literature there are numerous branches or subdivisions, among them the following:

Agricultural Chemistry, Analytical Chemistry, Apparatus, Biochemistry, Ceramics, Cement, Colloidal Chemistry, Dyestuffs and Dyeing, Electrochemistry, Explosives, Fermentation, Fertilizers, Foods, Fuels, Gas Manufacture, Glass Manufacture, General Inorganic Chemistry, Leather, Metallurgy, Mineralogical Chemistry, Oils and Fats, General Organic Chemistry, Paints and Varnishes, Paper Making, Perfumes, Petroleum Oils, Pharmaceutical and Medical Chemistry, Photography, Physical Chemistry, Plastics, Resins, Rubber, Sanitation, Soap, Sugar, Textiles, Theoretical Chemistry, Water, and Wood Distillation.

This list might be elaborated or abbreviated, depending upon the particular standpoint from which the field is considered.

Some of the chemical periodicals are of a general character and embrace many of these branches; others relate to certain branches only. The chemical literature,

1. The first part of the report is a general introduction.

2. The second part is a detailed description of the

3. The third part is a summary of the results.

4. The fourth part is a discussion of the results.

5. The fifth part is a conclusion.

6. The sixth part is a list of references.

7. The seventh part is an appendix.

8. The eighth part is a list of figures.

9. The ninth part is a list of tables.

10. The tenth part is a list of symbols.

11. The eleventh part is a list of abbreviations.

12. The twelfth part is a list of acronyms.

13. The thirteenth part is a list of definitions.

14. The fourteenth part is a list of footnotes.

15. The fifteenth part is a list of appendices.

16. The sixteenth part is a list of references.

17. The seventeenth part is a list of figures.

18. The eighteenth part is a list of tables.

19. The nineteenth part is a list of symbols.

20. The twentieth part is a list of abbreviations.

21. The twenty-first part is a list of acronyms.

22. The twenty-second part is a list of definitions.

23. The twenty-third part is a list of footnotes.

24. The twenty-fourth part is a list of appendices.

other than the periodical literature, is likewise in part of a general character, and in part specialized and limited to certain subjects or branches.

It is apparent that the chemical literature is of a most extensive character, both in the wide range of subjects which it includes, and the long period of time over which the literature extends.

VARIOUS KINDS OF SEARCHES OR INVESTIGATIONS

Searches or investigations of the chemical literature, of a more or less comprehensive character, may be made from various standpoints, e.g., by the research chemist, to familiarize himself with the available published information along the lines of his research; by the student, as a part of his studies or research; by the writer or author who, in his articles or publications, desires to give credit to the work of others, or to review the prior literature along the lines of his own publication; by the bibliographer, as the basis of his bibliography; by the manufacturer, to obtain information of interest along the lines of his manufacture, or along new lines of development; by the patent investigator, in connection with questions relating to the

novelty and patentability of inventions, and the validity and infringement of patents, etc.

It will be evident that the character and scope of the search or investigation will vary, depending upon the particular object the searcher has in view.

The value of any search or investigation of a comprehensive character will depend on its thoroughness and completeness, and this will in turn depend upon the facilities available for making the search and upon the ability and training of the searcher in making use of these facilities.

100-443887-1000

1. The first part of the document is a list of names and titles, including "The Hon. Mr. Justice" and "The Hon. Mr. Justice".

10. The following is a list of the names of the persons who have been named in the above-mentioned affidavits as having been in the possession of the same at the time of the same being seized:

• • •

LIBRARIES

The making of any comprehensive investigation necessarily requires that there shall be available a library containing the chemical literature properly classified and accessible for examination.

Libraries of this character will be found in the larger cities, and in many of the colleges, technical schools and universities, although the extent of the chemical literature, both book and periodical, will vary greatly in different libraries.

For many purposes the libraries of Washington offer facilities not elsewhere available. The Library of Congress is an excellent field of search because of its extensive number of publications and its card index catalogue, and particularly if permission be obtained to examine the classified works in the stacks of the library. For making searches through the patent literature, both U. S. and foreign, the library of the patent office offers facilities nowhere else available in this country. For medical literature the Surgeon-General's library is similarly without

SECRET

1. The purpose of this document is to provide information regarding the activities of the [redacted] in the [redacted] area. This information is being provided for your information and is not to be distributed outside of your office.

2. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area.

3. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area.

4. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area.

5. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area.

6. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area.

7. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area.

8. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area.

9. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area.

10. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area. The [redacted] has been identified as a [redacted] and is currently active in the [redacted] area.

a rival. The Agricultural Department library, the Smithsonian library and the Geological Survey and Bureau of Mines libraries are likewise of special value in their respective fields.

Many of the public libraries of the larger cities, as well as libraries such as the John Crerar Library of Chicago, the Franklin Institute library of Philadelphia and the Chemists' Club and Engineering libraries of New York, also afford excellent fields of search.

In addition to these public libraries and libraries which are generally open to the public, there are many private and special libraries, of associations, societies, corporations or individuals, which may contain valuable special collections along certain lines.

The importance and value of proper library service is well illustrated by the fact that at the annual meeting of the American Chemical Society at Buffalo (May 7-11, 1919) the program included a "Symposium on Library Service in Industrial Plants" with twelve different papers.

The publication, "Special Libraries", of the Special Libraries Association, contains much that is of interest from the general standpoint of library investigations, bibliographies, etc., and is to be recommended to those interested in such subjects.

In making use of a library's facilities the searcher may proceed in various ways, i.e., with the card index catalogue, with the classified books on the shelves of the library, with the general reference works or with the periodical literature.

Card Index Catalogues

Every library of consequence has its card index catalogue of the books and publications on the shelves of the library. The librarian is taught that "in any library the card catalogue is the main bibliographical tool for that particular library", and that "good cataloguing is the basis of all satisfactory service to the public".

In using the card index catalogue the searcher will naturally look under the same general or special subjects or headings, as in using the various indexes of chemical publications, although it may be necessary to look under more general, rather than or in addition to specific, subjects. After obtaining lists of the publications of the library along the lines in which he is interested, he may have the publications themselves brought to him, or he may, in many libraries, go to the shelves where the books them-

[illegible]

selves are classified.

Some libraries have special rooms where the more important scientific and technical periodicals and books are separately arranged for convenience of use. Thus, in the New York Public Library, the chemistry periodicals and the chemistry books of most importance are to be found in the "Science" and "Technology" rooms of the library, each room having its own card index catalogue.

Again, certain libraries have special card index catalogues. The Engineering Library in New York has a separate card index of searches made by the library staff, copies of which are available for examination. The patent office at Washington has an extensive card index of the chemical literature, with a formula classification of organic chemical compounds similar to that of Richter's "Lexikon".

Some libraries also include in their card index catalogues reference to leading papers appearing in the current technical and scientific periodicals. The Engineering and Public Libraries of New York include references of this character.

believe and understand.

Some of the most important

important scientific

and separately from the

the New York Public

the scientific books

the "Science" and "Technology"

from the New York

Again, some of the

assigned. The

separates and

topic of which

office at

chemical literature

these chemical compounds

"Science".

Some of the

often use

constant

nothing and

of this

In many fields of chemistry there are special books or monographs devoted to particular subjects, and sometimes containing copious references to the patent and periodical literature. A search or investigation may be very materially shortened if such a work is found devoted to the particular subject of the investigation. These works will usually be referred to in the card index catalogues.

Shelf Lists

From the card index catalogue of the library the searcher can ascertain the classes where the particular books in which he is interested are classified. He may find that some of the books are in one class, some in another, still others form a third, and so on. If it is permissible to go to the shelves or stacks of the library he may find in these same classes still other books of interest, which he did not find from the card index.

Information about the classification and arrangement of the books on the shelves, and even about books and publications relating to the particular field of the investigation, may frequently be obtained from the librarian or assistant in charge.

It is useful to keep in mind that both the Dewey decimal system of classification, and that of the Library of Congress, provide for the separate classification of science and technology. Thus, in the Library of Congress classification, Class Q relates to Science and Class T to Technology. Chemistry is classified in Class QD; Chemical Technology in Class TP. Agricultural Chemistry is separately classified in Class S, (Agriculture); Medical and Pharmaceutical Chemistry in Class R, (Medicine); Physiological Chemistry in Class QP, (Science); Mineral Industries, including Metallurgy, Fuels, etc., in Class TN, (Technology), etc. Some publications relating to chemical subjects are also classified in the class of Economics (Class H), while others may be found in sets of government publications, or among series of bulletins or publications of universities, etc., and separately classified for that reason. For a complete search of the library's facilities, accordingly, it is important to use both the card index catalogue and the shelf lists relating to the particular subjects of the investigation.

GENERAL REFERENCE WORKS

For some purposes it is more profitable to begin with the general reference works, which will be found in considerable number in all of the larger and more important libraries, than with the card index catalogue or the classified shelf lists. These general works include dictionaries, hand-books, encyclopedias, technologies, bibliographies, indexes of various kinds, etc., and are often separately classified from the rest of the chemical literature.

Some of these reference works will themselves be found to contain a great deal of information on many different subjects, particularly in the case of dictionaries and technologies, and some of the hand-books and encyclopedias; others will be found to consist mainly of indexes or bibliographies which direct the investigator to the periodical literature for further information. Sometimes reference works such as Beilstein or Richter, in organic chemistry, or Gmelin-Kraut or Abegg, in inorganic chemistry, will be the best place to start in making the investigation.

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

THE HISTORY OF THE

Some of the general reference works that may be used to advantage in making investigations are briefly referred to below. This list does not purport to be at all complete or comprehensive, but is intended rather as illustrative.

Dictionaries

Thorp's "Dictionary of Applied Chemistry", Pub. 1912-1913, in five volumes, is one of the best known and most valuable of the chemical dictionaries. It contains many valuable monographs and numerous references to the original literature.

Watt's "Dictionary of Chemistry", Pub. 1892-1894, in four volumes, is an older, but in some respects an even more valuable work.

Wurtz's "Dictionnaire de Chimie Pure et Appliquee", in three volumes, published in 1874, with its 1st Supplement, in two volumes, and its 2nd Supplement, in seven volumes (published 1892-1908), is another valuable reference work, and contains numerous references to the original literature.

Encyclopedias

Fremy's "Encyclopedic Chimique", in 93 volumes,

... ..
... ..
... ..
... ..
... ..

... ..

... ..
... ..
... ..
... ..
... ..

... ..
... ..
... ..
... ..

... ..
... ..
... ..
... ..
... ..

... ..

... ..

published 1882-1890, with an index volume (Table Alphabetique des Matieres) published in 1899, is an elaborate work, but not as valuable as its size would indicate.

Ullmann's "Enzyklopaedie der technischen Chemie" promises to be a valuable work. Only three volumes, published in 1914, have so far appeared.

Hand-Books

Gmelin's "Hand-Book of Chemistry" was translated by Watts, and published by the Cavendish Society, in eighteen volumes, the first six of which relate to inorganic chemistry, and the last twelve to organic chemistry. The first volume was published in 1848, the eighteenth volume in 1871. A separate index volume was published in 1872. Seventy-seven periodicals are listed in the beginning of the first volume. The original German work by Gmelin was published in seven volumes, three relating to inorganic chemistry and four to organic chemistry.

This publication is one of the best and most valuable of the early reference works, and it contains, in digest or abstract form, reference to most of the important chemical literature prior to the middle of the 19th century.

The following extracts from the historical survey in the introductory portion of Vol. 1 are of interest as showing the state of chemical knowledge at the date of publication (1848).

"In ancient times the progress of chemistry was slower, in modern times it has been more rapid than that of any other science. Up to the end of the seventeenth century, chemical knowledge was confined to a few isolated facts, either relating to metallurgy and other chemical arts or to the preparation of medicines, or such as were accidentally discovered during the fruitless search of the alchemists after the philosopher's stone, the transmutation of metals, etc.

"Among the nations of antiquity the Egyptians appear to have possessed the greatest amount of chemical knowledge. They prepared sal-ammoniac, soda, common salt, vitriol, glass, enamel, tiles, painted earthenware, several metals and metallic alloys, soap, beer, vinegar, various medicines and pigments, and knew how to fix colors on silk by means of mordants.

"Geber, one of the earliest (Arabian) chemists, who lived in the eighth century, was acquainted with milk of sulphur, nitric acid, aqua regia, solution of gold, nitrate of silver, corrosive sublimate, red oxide of mercury, the preparation of litharge, etc.

145

1. The first step is to identify the problem or question that needs to be answered.

100

599

;

1

"The words alkali, alcohol, aludel, etc., which are still in constant use, originated with the Arabs.

"The crusades served to transplant the chemical knowledge and views of the Arabs into Europe.

"Scheele, between the years 1773 and 1786, discovered, with very slender means, chlorine, the hydrochloric, nitrous, lactic, gallic, and uric acids; also baryta, manganese (partly) oxygen gas (discovered just before by Priestley):

"Priestley, who first collected gases over mercury, discovered in 1770 and the following years, oxygen gas, protoxide of nitrogen, carbonic oxide, ammoniacal, sulphurous acid and muriatic acid gases and the gaseous fluoride of silicon:

"Within the last few years, the electro-chemical phenomena have been most successfully investigated by Faraday, De Larive, Becquerel and others; and the field of organic chemistry has, by the labours of Berzelius, Liebig, Woehler, Mitscherlich (the founder of the theory of Isomorphism), H. Rose, Mulder, Chevreul, Dumas, Pelouze, Laurent, Malaguti, and many others,- been enlarged to such an extent that it has become almost a new science."

There is a tendency among students and among some chemists to consider that the main strides in the advance of chemical knowledge have been within the last few years, but reference to Gmelin's Hand-book shows that far more information was available half a century ago, both in in-

organic and organic chemistry, than is commonly appreciated.

Gmelin-Kraut

Perhaps the most elaborate and exhaustive digest of inorganic chemistry is Gmelin-Kraut's "Handbuch der anorganischen Chemie". This handbook follows the same general plan as the earlier handbooks by Gmelin, giving a bibliography at the beginning of each subject and a discussion of the properties, methods of preparation and commercial methods of manufacture of the various metals and of their various compounds. Some one hundred and seventy periodicals are listed in the introductory portion of the first volume. The work is still incomplete, but the volumes which have been published, and the fields which they cover, are indicated by the following table:

"Vol. 1, Pt. 1, published 1907, 888 pages.
Oxygen, Hydrogen, Helium, Argon, Neon, Krypton,
Xenon, Nitrogen, Sulfur, Selenium.

"Vol. 1, Pt. 2, published 1909, 441 pages.
Fluorine, Chlorine, Bromine, Iodine.

"Vol. 1, Pt. 3, published 1911, 907 pages.
Phosphorus, Boron, Carbon.

"Vol. 2, Pt. 1, published 1906, 512 pages.
Potassium, Rubidium, Calcium, Lithium, Sodium.

"Vol. 2, Pt. 1, published 1909, 726 pages.
Barium, Strontium, Calcium, Magnesium, Beryllium,
Aluminum.

"Vol. 3, Pt. 2, published 1908, 1135 pages, Radio-active material (Uranium, Thorium, Radium, Polonium, Radio-Tellurium, Radio-active Lead, Actinium and Emanium, etc.), Vanadium, Manganese, Arsenic, Antimony, Tellurium, Bismuth.

"Vol. 4, Pt. 1, published 1911, 1056 pages. Zinc, Cadmium, Indium, Gallium, Germanium, Tin, Thallium.

"Vol. 5, Pt. 1, published 1909, 1595 pages, Nickel, Cobalt, Copper.

"Vol. 5, Pt. 2, published 1914, 1752 pages, Silver. Gold, Mercury."

The unpublished volumes of this Handbook are as follows:

"Vol. 3, Pt. 1, Titanium, Silicon, Chromium, Tungsten, Molybdenum, Uranium.

"Vol. 4, Pt. 2, Lead, Iron.

"Vol. 5, Pt. 3, Platinum, Palladium, Rhodium, Iridium, Ruthenium, Osmium.

"Vol. 6, Zirconium, Thorium, Tantalum, Niobium, Cerium, Lanthanum, Dysprosium, Neodymium, Praseodymium, Yttrium, Ytterbium, Scandium, Erbium, Terbium."

Other Handbooks and Treatises

Abegg's "Handbuch der anorganischen Chemie", published 1905-1913, is another standard reference work on inorganic chemistry, and is perhaps better known than Gmelin-Kraut.

Dammer's "Handbuch der anorganischen Chemie" is of similar character, though of earlier date.

Roscoe and Schorlemmer's "Treatise of Chemistry", in

English, and Moissan's "Traite der Chimie Minerale", in French, are also useful reference works.

General Reference Works, Organic Chemistry

The most valuable work in the field of organic chemistry for use as a digest or reference work is Beilstein's "Handbuch der Organischen Chemie". Every organic chemist who has occasion to make investigations of the literature should be well acquainted with it.

The third edition was published in four volumes, from 1893 to 1899; the four supplemental volumes in 1901 to 1906; the supplemental volumes (Ergänzungsbände) following the same general plan as the original volumes. The fifth supplemental volume or index volume was also published in 1906. The scope of the work will be indicated from the following:

Vol. 1, published 1893, Fatty Series, 1586 pages.

Vol. 2, published 1896, Aromatic Series (Hydrocarbons, Phenols, Alcohols, Acids), 2210 pages.

Vol. 3, published 1897, Aromatic Series, Aldehydes, Ketones, Quinons, Camphor Products, Terpenes, Ethereal Oils, Resins and Balsams, Glucosides, Bitter and Indiffer-

ent substances, Dyestuffs, Tanning Material, Furane Series (Thiophenbodies) Alkaloids.

Vol. 4, published 1899, Aromatic Series, Bases, Azoxy-, Azo-, Hydrazo-, Diazo-, Diazoamino- Derivatives, Albuminates, Phosphorus-, Antimony-, Arsenic-, Bismuth-Compounds, Boron and Silicon compounds. Metallo-Organic Compounds.

Each volume is provided with an index, but these are superseded by the supplementary Index Volume No. 5, which gives an elaborate name index of the various compounds of organic chemistry described in the entire work.

Beilstein is supplemented by Richter's "Lexikon der Kohlenstoff-Verbindungen", in four parts, published in 1910-1912. This Lexikon is a collective index to Beilstein and also contains numerous other literature references covering the period up to and including 1909.

Subsequent to 1909, Stelzner's "Literature-Register der Organischen Chemie" covers the literature of organic chemistry for the period of 1910-1911.

Another index which should be mentioned in this connection is the card index catalogue of the patent office

of the ... (Trichostema ...)

... (Trichostema ...)

... (Trichostema ...)

... (Trichostema ...)

... (Trichostema ...)

at Washington. This catalogue, so far as it relates to organic chemistry, has a very similar system of classification by formula to that of Richter's "Lexikon". This card index is not, of course, available except at Washington. It has been compiled under the direction of Dr. Edwin A. Hill, of the Classification Division of the patent office, and its character and scope are described in articles by Dr. Hill appearing in the Journal of the American Chemical Society, Vol. 2, year 1900, pages 478-494; Vol. 29, year 1907, pages 936-941; and Vol. 34, year 1912, pages 416-418. It is also described in Appendix K of the report of the investigation of the United States patent office made by the President's Commission on Economy and Efficiency in 1912, (House of Representatives Document No. 1100, 62nd Congress, Third Session.)

Bolton - Select Bibliography of Chemistry

Another important work of a bibliographical character is the "Select Bibliography of Chemistry", by Henry G. Bolton, published by the Smithsonian Institution (Smithsonian Miscellaneous Collection Nos. 850, 1170 and 1253).

The first volume of this Bibliography was published in 1893 and covers the period from 1492 to 1892. The first supplement, published in 1899, covers the period from 1492 to 1897, and includes works omitted from the first volume, together with those appearing up to the end of the year 1897. The character of this Bibliography will be apparent from the following quotation from the preface of the first volume:

"An attempt has been made in the following pages to collect the titles of the principal books on Chemistry published in Europe and America from the rise of the literature to the close of the year 1892. The term Chemistry is taken in its fullest significance, and the Bibliography will be found to contain books in every department of chemical literature, pure and applied;

"The Bibliography is confined, however, to independent works and their translations, and does not, as a rule, include Academic Dissertations (which are so numerous as to require a special catalogue), nor so-called "reprints" or "separates" (Separat-Abdrücke); of the latter only a few score are ordinarily printed and they must be regarded as belonging to periodicals. No attempt has been made to index the voluminous literature of periodicals except in the Section of Biography as noted below.

"To facilitate reference the work is divided into seven sections:

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

...

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

- I. Bibliography.
- II. Dictionaries.
- III. History.
- IV. Biography.
- V. Chemistry, pure and applied.
- VI. Alchemy.
- VII. Periodicals."

Altogether the first volume contains some twelve thousand titles, while the first supplement has fifty-five hundred more, making more than 17,500 in all. Of these titles 273 of the first volume and 95 of the supplement, relate to Bibliographies, while 327 of the first volume and 84 of the supplement relate to Dictionaries and Tables.

The third volume of this "Select Bibliography of Chemistry", by Bolton, relates to "Academic Dissertations". The Dissertations are indexed numerically under the authors' names, but the book is also provided with a subject-matter index. The nature of the work will be apparent from the following extracts from page 3:

"This bibliography is not an index to the chemical dissertations that have appeared in periodicals, but a list of those that have been printed independently. When compiling the list of titles I was fortunate in securing permission to make copies of the card-catalogues of two large collections of dissertations on chemistry, those in University Library, Strassburg, and those in the library of the United States Geological Survey,

Washington City. I had also the opportunity of cataloguing several thousand dissertations deposited by the Smithsonian Institution in the Library of Congress; the latter were chiefly of German origin.

"For the convenience of residents of the United States the dissertations found in the libraries of the Geological Survey and of the Smithsonian Institution are indicated by the letters "G. S." and "S. I." respectively."

Catalogue of Scientific Papers

This work, which is still incomplete, has been compiled and published by the Royal Society of London. It has properly been referred to as the most comprehensive index to general science ever attempted. The first six volumes, published 1867-1872, cover the period from 1800 to 1863. In the preface of Vol. 1, it is said:

"This catalogue is intended to serve as an index to the Titles and Dates of Scientific Papers contained in the Transactions of Societies, Journals and other Periodical works which have been published from the beginning of the present century to the end of the year 1863."

In the introduction of this same volume the subject-matter of the catalogue is discussed in part as follows:

... of the ...
... of the ...
... of the ...
... of the ...

... of the ...
... of the ...
... of the ...
... of the ...

... of the ...
... of the ...

... of the ...
... of the ...
... of the ...
... of the ...
... of the ...
... of the ...

... of the ...
... of the ...
... of the ...
... of the ...

... of the ...

... of the ...

"The following Catalogue is intended to contain the title of every Scientific Memoir which appears in the various Transactions and Proceedings of Scientific Societies, and in the Scientific Journals published within the time which it comprehends; with the Reference, the Date, the Author's name and the number of pages in the Memoir.

"A list of the Works indexed, nearly fourteen hundred in number, arranged alphabetically according to the contraction employed in the Catalogue, will be found at the end of the Introduction.

"The Titles are arranged alphabetically according to the Authors' names, the arrangement under the head of any one author being Chronological."

The second series of the Catalogue, Vols. 7 and 8, published 1877-1879, covers the period from 1864 to 1873. The third series, in three volumes, (9 to 11), published 1891-1896, covers the period from 1874 to 1893. A supplementary volume, Vol. 12, published in 1902, contains additional papers published between 1800 to 1883.

The papers of this supplementary volume were taken from more than 350 added periodicals, so that, with the nearly 1400 periodicals indexed in the first volume, and with the 130 more added in Volume 6, the total number of periodicals indexed in the Catalogue of Scientific Papers

... ..
... ..
... ..
... ..
... ..
... ..
... ..

... ..
... ..
... ..
... ..
... ..

... ..
... ..
... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

up to 1883, is between eighteen and nineteen hundred.

The fourth series of the Catalogue covers the period from 1884 to 1900. Vols. 13-16, for about half of the papers of the series, have so far been published, although their publication is of comparatively recent date (1914-1918). The remaining volumes are yet to appear.

When the Catalogue is completed, it will consist of an Author Catalogue and a Subject Index covering the entire period from 1800 to 1900. That is, the volumes of the Author Catalogue are to be supplemented by Index volumes of subject-matter covering the entire period from 1800 to 1900. The subject indexes are to be issued separately for each of the seventeen sciences dealt with in the "International Catalogue of Scientific Literature", and will be arranged in accordance with the schedules of the International Catalogue. The index volumes for Pure Mathematics, Mechanics and Physics have thus far been published. Unfortunately the index volume for Chemistry is not yet available. Until this volume is available, the Catalogue of Scientific Papers cannot be readily searched, except as an author index. However, for investigating the var-

ious papers of any given author between the dates 1800 and 1900, the Catalogue undoubtedly furnishes the most complete and comprehensive single index available. When the subject-matter index volumes are likewise available, it will then be the most complete and one of the most valuable indexes of the chemical literature of the nineteenth century.

"International Catalogue of Scientific Literature"

Beginning with the year 1901, the "International Catalogue of Scientific Literature" was published as a continuation of the "Catalogue of Scientific Papers" of the Royal Society of London, and it now appears annually, in seventeen volumes, for each of the seventeen sciences dealt with. These sciences or branches which are included in the catalogue are as follows:

- A. Mathematics
- B. Mechanics
- C. Physics
- D. Chemistry
- E. Astronomy
- F. Meteorology (including Terrestrial Magnetism)
- G. Mineralogy (including Petrology and Crystallography)
- H. Geology
- J. Geography (Mathematical and Physical)
- K. Palaeontology
- L. General Biology

- M. Botany
- N. Zoology
- O. Human Anatomy
- P. Physical Anthropology
- Q. Physiology (including experimental Psychology, Pharmacology and experimental Pathology.)
- R. Bacteriology.

In the list of the Journals, published as a separate volume in 1903, the surprising number of 4673 Journals is listed from twenty-five different countries. Germany leads with 1308. France is second with 919. The United States third with 539, and the United Kingdom fourth with 455, while Russia is fifth, with 397.

It is, of course, evident that the field covered by the International Catalogue, as well as that covered by the "Catalogue of Scientific Papers", is much broader than Chemistry, but inasmuch as a separate volume appears annually for each science, the consideration of the portion of the catalogue relating to Chemistry does not involve a consideration of the portions of the catalogue relating to other sciences. The "International Catalogue" is one of the most valuable indexes of the chemical literature for the period which it covers (since 1900).

1000
1000
1000
1000
1000

In the
of the

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

Repertorium der Technischen Journal Literatur

This work goes back to 1823, was edited by Schubarth for the volume covering the period 1823 to 1853, and by Kerl for the two volumes covering the periods 1854 to 1868 and 1869 to 1873. Beginning 1874 it appeared annually, and since 1877 it has been published by the German patent office. Prior to 1879 it was known as the "Repertorium der Technischen Literatur"; since 1879 it has been known as the "Repertorium der Technischen Journal Literatur".

It has had an author index since 1897 in addition to the subject index which it has always contained. The last volume of the Repertorium was published in 1908.

The general arrangement of the Repertorium is alphabetical, by subjects, and it contains reference to a large number of the leading articles appearing both in the German and in other periodicals for the current year. The field covered includes much that has no relation to chemistry and metallurgy, but it is, nevertheless, a valuable index for use in searches of the chemical and metallurgical literature. It is, of course, equally valuable in other fields than chemistry.

THE UNITED STATES OF AMERICA DEPARTMENT OF AGRICULTURE

OFFICE OF THE SECRETARY, WASHINGTON, D. C.

TO THE HONORABLE THE SECRETARY OF AGRICULTURE

FROM THE HONORABLE THE SECRETARY OF AGRICULTURE

RE: [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

The Industrial Arts Index

This Index is published by the H. W. Wilson Company, 953-964 University Avenue, New York. The plan of the Index is set forth by the publishers in the following language:

"The Industrial Arts Index is an indexing service to eighty-one technical journals which have been selected by our subscribers as the leaders in their respective fields. It reaches you in magazine form (instead of loose cards) ten times a year. The entries are arranged alphabetically by subject and repeated under place names when necessary. Every article of importance in these eighty-one magazines is indexed under as many subject headings as will bring out all points of interest, and cross references direct to the searcher of allied subjects in other parts of the alphabet.

"The rate for this service is based on the number of periodicals indexed for which you subscribe."

Annual volumes of the Index have been published since 1912.

This Index is not comparable with Chemical Abstracts, either in the scope of the field covered or in the detailed information which it gives, but it is, nevertheless, a useful index for many purposes, and one with which the searcher should be familiar. It includes much that is of gener-

[illegible]

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 84

al interest which is outside the field of chemical literature.

Mining World Index

The Mining World Index of current literature was first published in 1912 by the Mining World Company of Chicago. It was edited by the editor of the Mining and Engineering World and was published as "An International Bibliography of Mining and the Mining Sciences, compiled and revised semi-annually from the Index of the World's Current Literature, appearing weekly in both Mining and Engineering World".

This index is, of course, of more particular interest to those making investigations of the mining and metallurgical literature.

Engineering Index

The Engineering Index is an index which is likewise of more particular interest in connection with technical and engineering subjects, but it will, nevertheless, in some cases, be found useful in those branches of applied chemistry which are included within its scope. Four

The first part of the report is devoted to a description of the general situation in the country, and to a summary of the results of the work done during the year.

GENERAL SITUATION

The general situation in the country is characterized by a steady increase in the production of goods and services, and by a corresponding increase in the standard of living of the population. The results of the work done during the year are summarized in the following table:

| Item | 1955 | 1956 | 1957 |
|--|-------|-------|-------|
| Grain production (million tons) | 10.5 | 11.2 | 12.0 |
| Industrial production (million rubles) | 150.0 | 165.0 | 180.0 |
| Construction (million rubles) | 80.0 | 90.0 | 100.0 |
| Transportation (million rubles) | 40.0 | 45.0 | 50.0 |
| Trade (million rubles) | 30.0 | 35.0 | 40.0 |

The above table shows that the production of goods and services has increased steadily over the three-year period, and that the standard of living of the population has correspondingly increased. This is a result of the successful implementation of the Five-Year Plan, and of the continued efforts of the Government and the people to develop the country's economy.

CONCLUSIONS

The results of the work done during the year are a clear indication of the success of the Five-Year Plan, and of the continued efforts of the Government and the people to develop the country's economy. The production of goods and services has increased steadily over the three-year period, and the standard of living of the population has correspondingly increased. This is a result of the successful implementation of the Five-Year Plan, and of the continued efforts of the Government and the people to develop the country's economy.

volumes of the Index cover the period from 1884 to 1905, and annual indexes have since been published. In 1906 the Index covered about 250 technical and engineering journals in six different languages, about one-fourth of the periodicals indexed being in languages other than English.

PUBLIC DOCUMENTS

Copies of some Government publications are sent free upon request to the particular Bureau or Department from which they are issued. When they are not thus available copies can be obtained from the Superintendent of Documents at the Government Printing Office, Washington. Price lists of Government publications relating to different subjects are issued by the Superintendent of Documents and are sent free upon request. The following is copied from one of these price lists:

"The Government of the United States is the greatest of all publishers of scientific works. It employs thousands of scientists, who are engaged the year round in making researches and investigations in all branches of agriculture, in geology, in mining, in electricity, in chemistry, in astronomy, in engineering, in aviation, in preventive medicine, in forestry, in irrigation, and almost all

other branches of scientific inquiry. The arts of war as well as those of peace are also actively cultivated. The greatest art of all, that of free government, is strenuously carried on by President, Cabinet, Senators and Representatives.

"The results of all these activities of the most comprehensive and effective organization ever known are constantly reduced to print and poured out in an incessant flood from the largest printing works in the world.

"These publications of the Government Printing Office in Washington constitute the Public Documents of the United States.

"The greater number of them are sold by the Superintendent of Documents, located in the Government Printing Office. The Government did not establish this sales office for purposes of profit, but as a public convenience. The prices charged cover only paper and printing, no charge being made for the services of the statesmen and scientists who are the authors of the astonishingly varied books, pamphlets, periodicals and maps, and no commissions being allowed to anybody. The documents even have the freedom of the mails and are sent without postage.

"The only condition is that payment be made in advance of shipment. The Superintendent of Documents is not authorized to supply free copies, except of his Price Lists, and it is useless to ask him to do so."

Separate lists of publications of some of the Government departments or bureaus are also published; for example, the Geological Survey publications; those of the Bureau of Mines; those of the Library of Congress, etc., and lists of these publications are obtainable upon request.

Since 1914 the Journal of Industrial and Engineering Chemistry has had abstracts of Government publications.

PERIODICALS

The periodical literature is so extensive that a comprehensive search through it is often difficult, yet it forms one of the most valuable fields of search because of the numerous original papers which it contains and the wide field which it covers.

Frequently it is possible through the general reference works (previously referred to) to obtain reference to many of the relevant papers of the periodical literature. In organic chemistry the searcher may thus begin with Beilstein and Richter; in inorganic chemistry with Gmelin, Kraut or Abegg; and from these or other reference works he will be directed to the periodicals where the original papers are to be found. The extent to which the periodical literature can be covered in this way will vary greatly with different subjects.

Where suitable general reference works are not available, or when they have been exhausted, the searcher

must turn to the periodicals themselves. The abstract journals are of special value for search purposes, because of the wide field which they include. Chemical Abstracts is thus an abstract index or digest of some 783 other periodicals covering the whole field of chemistry and chemical industry.

Cumulative or general indexes covering a number of years are also of particular value. A preliminary examination of a few of these general indexes will often enable the searcher to tell whether the literature of the subject he is investigating is abundant or meagre, and in what direction the search can most profitably be continued.

In looking up original articles it will frequently be found that one article contains reference to many others of earlier date relating to the same general subject. These references may represent the results of a comprehensive search which the writer of the article made in preparation for his own investigations. Not infrequently one article will thus give a fairly complete review of the prior available sources of information along the very line in which the searcher is interested. Some of the prior articles

thus referred to may in turn refer to others, and so on.

Again, bibliographies will sometimes be found either in the periodicals themselves, or in some other publication of which the citation is given, and these bibliographies may give the results of an extended search made by the bibliographer in its preparation.

By making use of short-cuts, such as bibliographies or articles giving the results of searches made by others, cumulative indexes of periodicals, abstract journals and general reference works, the searcher will frequently be able to obtain much of the readily available information upon any particular subject within a comparatively short time.

In making a comprehensive search, however, it is necessary to proceed in a systematic manner through the periodical literature itself. The abstract journals will naturally receive first consideration. When the ten-year subject-matter index of Chemical Abstracts (1907-1916) is available, this will furnish one of the best starting points for searching the recent literature. The annual indexes and the current numbers of Chemical Ab-

1. The first part of the document

describes the general situation

and the main objectives of the study

2. The second part of the document

describes the methodology used in the study

3. The third part of the document

describes the results of the study

4. The fourth part of the document

describes the conclusions of the study

5. The fifth part of the document

describes the limitations of the study

6. The sixth part of the document

describes the future research

7. The seventh part of the document

describes the references

8. The eighth part of the document

describes the appendix

9. The ninth part of the document

describes the index

starcts will bring the matter practically up to date. It should be kept in mind, however, that Chemical Abstracts was less complete during the early years of publication, and that, complete as it now is, it cannot be relied upon as exhaustive, or as including reference to everything of interest appearing in other chemical publications.

Next to Chemical Abstracts, the most valuable abstract journals in English are the Journal of the Society of Chemical industry (published since 1882), and the Abstracts of the London Chemical Society.

The Journal of the Society of Chemical Industry has cumulative indexes for the periods 1882 to 1895, and 1896 to 1905, and annual indexes thereafter. It contains many original works, as well as a large number of abstracts, and it reflects and records the development of chemical industry in Great Britain, and, to a lesser extent, in other countries.

The Abstract Journal of the London Chemical Society is less comprehensive in the field it includes than Chemical Abstracts, but its abstracts are often more complete. It has been published as a separate publication since 1878.

Prior to that date the abstracts appeared as a part of the Journal of the Society. There are cumulative indexes covering the period from 1841 to 1872, and for each of the ten year periods thereafter up to 1902, and an author index for the period from 1903 to 1912.

Chemical News is another English periodical with a useful general index for the first 100 volumes, from 1860 to 1909.

Prior to Chemical Abstracts (1907), the abstract section of the Journal of the American Chemical Society was known as the "Review of American Chemical Research." It first appeared in the "Technology Quarterly" for the year 1895, and continued as a part of that publication through 1901.

Beginning with Vol. 3 (year 1897) the "Review of American Chemical Research" also appeared as a publication of the American Chemical Society, and continued to do so up to and including Vol. 12, of the year 1906. From 1895 to 1901 it was contributed by members of the instructing staff of the Massachusetts Institute of Technology, (Arthur C. Noyes, Editor). In the first issue of 1895

AM. 107-1 1-10

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.

11. 12. 13. 14. 15. 16. 17. 18. 19. 20.

21. 22. 23. 24. 25. 26. 27. 28. 29. 30.

31. 32. 33. 34. 35. 36. 37. 38. 39. 40.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.

11. 12. 13. 14. 15. 16. 17. 18. 19. 20.

21. 22. 23. 24. 25. 26. 27. 28. 29. 30.

31. 32. 33. 34. 35. 36. 37. 38. 39. 40.

41. 42. 43. 44. 45. 46. 47. 48. 49. 50.

51. 52. 53. 54. 55. 56. 57. 58. 59. 60.

61. 62. 63. 64. 65. 66. 67. 68. 69. 70.

71. 72. 73. 74. 75. 76. 77. 78. 79. 80.

81. 82. 83. 84. 85. 86. 87. 88. 89. 90.

91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

101. 102. 103. 104. 105. 106. 107. 108. 109. 110.

(Techn. Quart. Vol. 8, p. 90) it was stated that:

"The purpose of this publication, which is hereafter to appear serially in this journal, is to present in a concise form a review as complete as possible of all original work having a chemical bearing published in the United States after the beginning of the year 1895."

While this publication is not comparable in its scope or value with Chemical Abstracts, yet it is of particular interest to American chemists as the predecessor of Chemical Abstracts, and as a review of American research.

The Journal of the American Chemical Society is provided with a general index for the period from 1879 to 1898.

The American Chemical Journal also has cumulative indexes for the first ten volumes (1879 to 1888), for volumes 11 to 20 (1889 to 1898) and for volumes 21 to 50 (from 1899 to 1913). In 1914 it was incorporated with the Journal of the American Chemical Society.

Other important chemical periodicals in English are the following:

Journal of Industrial and Engineering Chemistry, published by the American Chemical Society since 1909;

Metallurgical and Chemical Engineering; (Electrochemical Industry, Vols, 1 and 2, 1902-1904; Electrochemical

and Metallurgical Industry, Vols. 3 to 7, 1905-1909.);

Transactions of the American Electrochemical Society, published since 1902, and with a general index for the first 20 volumes (1902-1999);

Engineering and Mining Journal, published since 1866;

Journal of the Franklin Institute, published since 1826, and with indexes for volumes 1 to 120 (1826-1885), 121 to 140 (1886-1895), and 141 to 160 (1896-1905).

This list is not intended to be complete, and many others could be added, particularly those relating to special fields, such as metallurgy, oils, pharmaceutical chemistry, etc.

In the metallurgical and mineral field, "Mineral Industry" and "Mineral Resources" are deserving of special mention.

Mineral Industry has been published since 1892, when its first volume appeared as:

"A Statistical Supplement of the Engineering and Mining Journal, The Mineral Industry, its Statistics, Technology and Trade, in the United States and other countries from the earliest times to the end of 1892."

1903: 17

1903: 18

1903: 19

1903: 20

1903: 21

1903: 22

1903: 23

1903: 24

1903: 25

1903: 26

1903: 27

1903: 28

1903: 29

It contains many articles on metallurgy, and a considerable number of bibliographies.

Mineral Resources is published annually by the Geological Survey, and has been published since 1882. In addition to its statistical information and many special articles on mineral production and technology, it also contains a considerable number of bibliographies.

If the searcher is limited to the field of English literature he may, nevertheless, make an extended search through the various cumulative indexes, abstract journals and other chemical periodicals, such as those above referred to and others relating to special fields. In any comprehensive investigation, however, the searcher will find it a serious handicap if he does not have a working knowledge of French and German, particularly German, since so much of the chemical periodical and technical literature is published in these languages, and especially in German, and since so many of the general reference works and works on special subjects are published in German.

Among the German periodicals "Chemisches Central-Blatt" is the Abstract Journal corresponding to Chemical

Abstracts. It goes back to 1856, and has general indexes covering at least part of the volumes since that time.

Another valuable German abstract journal is the "Jahresbericht über die Fortschritte der Chemie". It has been published since 1847 and has cumulative indexes covering about ten year periods up to 1904.

For Industrial Chemistry, Wagner's "Jahresbericht der Chemischen Technologie" is a valuable record of chemical technology in German and has cumulative indexes covering about ten year periods from 1859 to 1904.

Berichte der Deutschen Chemischen Gesellschaft, published since 1868, included abstracts up to 1896. It has general indexes up to 1907.

Other important German chemical periodicals are the following, although the list is not intended to be complete:

Zeitschrift für Angewandte Chemie, with cumulative index covering the period from 1887 to 1907.

Zeitschrift für Anorganische Chemie, with a general index for the first fifty volumes from 1892 to 1906.

Zeitschrift für Physikalische Chemie, with cumulative indexes covering the first fifty volumes from 1887 to 1905.

— *Journal of the American Medical Association*, 1967, 201: 1001-1002.

Journal für Praktische Chemie, published since 1828, and with cumulative indexes.

Dingler's Polytechnische Journal, published since 1820.

Liebig's Annalen published since 1832 and with general indexes up to 1911.

Poggendorff's or Wiedemann's Annalen, published since 1824, with Gilbert's Annalen taking it back to 1799.

Die Chemische Industrie, published since 1877.
Monatshefte für Chemie, published since 1880.

The French Literature is less extensive than the German, but there are likewise abstract periodicals and periodicals with general indexes.

The "Bulletin de la Société Chimique de France" (prior to 1907 "Bulletin de la Société Chimique de Paris") has been published since 1858 and contains abstracts. It also has general indexes up to 1906.

The "Annales de Chimie et de Physique" goes back to 1789 and for a long time contained abstracts. It has general indexes up to 1903.

The "Comptes Rendus" has been published since 1835 and has general indexes up to 1900.

The "Revue générale de chimie pure et appliquée", published since 1899, with its supplement, the "Répertoire générale de chimie pure et appliquée", published since

1901, is an abstract and review periodical.

The "Revue de chimie industrille" has been published since 1890.

In the French literature (and the same is true of the literature of other countries) much of the chemical literature is contained in the general science publications, e.g., the "Moniteur Scientific", published since 1857.

In addition to the periodicals above mentioned, there are many more, including other periodicals of the same countries, as well as periodicals of other countries. In particular there are many periodicals relating to special fields, which those interested in those fields will naturally include in their investigation. We thus find periodicals devoted to rubber, oils, gas, colloids, metallurgy, electro-chemistry, physical chemistry, medicinal chemistry, etc. A more detailed discussion of these various fields and periodicals is outside the scope of the present paper. The searcher will readily locate and identify the available periodicals of interest in connection with his investigation from the general reference works, from the abstract journals, or from the card index catalogues.

Not infrequently the searcher will be referred to periodicals which are not accessible in the library in which his search is being made, and it may be important to obtain further information about a particular article in such a periodical, or to find out whether the periodical itself is available in some other library.

If the date of publication and the author are known, a search of the contemporaneous periodical literature may disclose that the same article was reproduced, or that abstracts of it were published, in other periodicals. The same original article may thus be abstracted in Chemical Abstracts, in the Abstracts of the London Chemical Society, in the Journal of the Society of Chemical Industry, in Chemische Central-Blatt, and in other abstract or review periodicals, and it may also be reproduced in part or in whole in periodicals of other countries.

To ascertain whether any particular periodical is available in other libraries, reference must be had to the available check lists of these libraries.

Check Lists of Periodicals

For periodicals prior to 1895 the most valuable

library check list of periodicals is that of Bolton in his "Catalogue of Scientific and Technical Periodicals, 1665-1895". This list includes 133 American libraries and about 3160 scientific and technical periodicals, and indicates in which libraries each periodical may be found.

Various other check lists and union lists of periodicals have been issued for certain libraries, or the libraries of certain cities, including the following:

"Union List of Periodicals, Transactions, etc., currently received in the Principal Libraries of the District of Columbia", Pub. 1901, by the Library of Congress.

Catalogue of Technical Periodicals, Libraries in the City of New York and Vicinity, Pub. 1915, by the United Engineering Society.

A List of Serials in the Public Libraries of Chicago and Evanston, Pub. 1901, by the Chicago Library Club, and The John Crerar Library Supplement, Pub. 1906.

A list of Current Periodicals in the Reading Room, The John Crerar Library, Chicago, Pub. 1902.

A list of Serials in the Principal Libraries of Philadelphia and its Vicinity, Pub. 1908, and Supplement, Pub. 1910. (Bulletins of The Free Library of Phila. Nos. 8 and 9.)

A List of Periodicals, Newspapers, Transactions and other Serial Publications Currently Received at the Principal Libraries of Boston and Vicinity, Pub. 1897.

A list of Periodical Publications Currently Received by the Public Library of the City of Boston, Pub. 1903.

Report of the Committee on "A List of the Scientific and Technical Serials in the Libraries of the State of Indiana". (Reprint from Ind. Acad. of Sci. Report for 1913).

A Joint Catalogue of the Periodicals, Publications and Transactions of Societies and Other Books Published at Intervals, in the Various Libraries of the City of Toronto, Pub. 1913, Univ. Press, Toronto.

Periodicals and Other Serials currently received by the Carnegie Library of Pittsburgh, 7th Ed., Pub. 1915.

Current Periodicals on File in the Reading Room, Library of the Franklin Institute, Philadelphia, Pub. 1916 (Bull. No. 4.)

Union List of Serials in the Libraries of Rochester, Pub. 1917, Rochester Pub. Library.

Catalogue of the Periodicals and Other Serial Publications in the Library of the U.S. Dept. of Agriculture, Washington, Pub. 1901, (Liby. Bull. No. 37); and Supplement No. 1, 1901-1905, Pub. 1907.

Alphabetical List of Abbreviations of Titles of Medical Periodicals employed in the Index-Catalogue of the Library of the Surgeon-General's Office, U.S. Army from Vol. 1 to Vol. 16, inclusive. Pub. 1895.

List of Serials in the Univ. of Illinois Library, and other Libraries of Urbana and Champaign, Pub. 1911. (Univ. of Ills. Bull. Vol. 9, No. 2).

List of Serials in the Univ. of Colorado Library, Pub. 1913, Boulder, Colorado. (Univ. of Colo. Bull. Vol. 13, No. 1).

Periodicals and Serials in the Library of The Catholic Univ. of America, Washington, Pub. 1910.

List of Serials in the Univ. of California Library, Pub. 1913. (Univ. of Cal. Liby. Bull. No. 18).

List of Serials in the Leland Stanford, Jr., Univ. Library, Pub. 1916.

PATENTS

Patents, from their very nature, require consideration from various aspects other than as a part of the chemical literature. Thus, the patentability of inventions, the filing and prosecution of applications for patent, the construction, validity and scope of issued patents, questions of infringement of unexpired patents, patent litigation, property rights in patents, the rights and obligations of patentees, etc., are matters primarily involving patents as patents, rather than as publications; and are matters requiring consideration from the standpoint of the relevant principles of the patent law applicable thereto, as well as from the standpoint of the chemical principles involved.

Patent searches or investigations may thus be of a special character. In considering questions of infringement, for example, the primary search extends only through the U. S. patents granted during the last seventeen years (the term of a U. S. patent), and requires consideration of the invention claimed rather than, or in addition to, the invention described, but inasmuch as the claims of a patent may require to be construed by the accompanying description and in the light of the patent

office proceedings leading up to the grant of the patent, as well as in view of the prior state of the art disclosed by prior patents and publications, and in accordance with relevant principles of the patent law, a more extended search to include expired U. S. patents and other patents and publications may be important or even essential.

Investigations of the patentability of inventions, such as are made to determine the advisability of making application for patent, or by the patent office examiners in determining the patentability of inventions set forth in patent applications, as well as investigations of the scope and validity of issued patents, may likewise require an extended search of the prior patents and publications, to determine whether the invention is new, and whether it is a patentable invention or discovery, within the meaning of the patent law.

Patent investigations thus include both investigations of patents as patents, and investigations or searches of patents as publications and as a part of the chemical literature.

THE PATENT LITERATURE

Considered as a part of the chemical literature, the patent literature furnishes one of the most important

fields of search, inasmuch as it records the inventions and improvements, and hence the progress made in almost all fields of chemical industry. Not infrequently inventors have patented their inventions without having published any descriptions of them elsewhere, and without any abstracts or digests of their inventions appearing in the periodical literature. The patent literature therefore contains much that is not available elsewhere.

More than 1,300,000 U. S. patents have been granted, of which a very considerable number relate to chemistry and allied subjects. A proper classification of these patents is therefore indispensable for search purposes. The classified patents, however, are available only at the patent office at Washington, and, for this reason, comprehensive searches through the various classes of U. S. patents can be satisfactorily made only in Washington.

The classification of U. S. patents, so far as it is official, is set forth in the "Manual of Classification" (Pub. 1916); in the "Definitions of Revised Classes and Subclasses" (Pub. 1912); and in the "Classification Bulletins" which are issued semi-annually by the patent office.

The "Manual of Classification" gives instructions

for searching the classified U. S. patents, together with a list of classes and subclasses and an index of class and subclass titles. It is in constant use by those making searches at the patent office.

The work of classifying U. S. patents, of which there are about three hundred separate classes and thousands of sub-classes, has been largely conducted by the Classification Division of the Patent Office. A history of this Division and of its work and methods of classification is given in the "Report of the Investigation of the United States Patent Office", made by the President's Commission on Economy and Efficiency, (published in 1912 as H. R. Document No. 1110, 63rd Congress, Third Session). A short description of the Scientific Library of the Patent Office and of the search room, as well as of the card index of Chemical Literature, is also given in this report, (Appendix K).

The difficulties in making a satisfactory classification of patents for search purposes is complicated by the different kinds of patent searches required, - whether novelty, validity or infringement, and this difficulty is well recognized by the patent office. There has been at times an unfortunate tendency, in the classification of chemical and related patents, to disregard the prevailing classification of the other chemical

literature, and to use unusual terms, and make unusual lines of distinction, which the average chemist does not readily recognize, and which may even give trouble to the experienced patent searcher.

As is to be expected, the chemical patents are classified in more or less definite and distinct classes, and are segregated, for purposes of examination, in a few examining divisions. The official classes of patents are accessible in the public search room of the patent office. Duplicate sets of classified patents are provided in the examining divisions. Many of the chemical classes of patents have never been officially reclassified, and the present official classification is often unsatisfactory for search purposes. Some of these classes have, however, been in part unofficially reclassified by the examiners who have examined them, so that a more satisfactory classification will be found in the examining divisions. It is thus quite common for different examiners to have special subclasses or digests of patents, both U. S. and foreign, as well as of other publications, along the lines which they have occasion to search. Some of these digests are of very great value, but unfortunately they are not accessible except in the examining divisions. Permission to examine them can, however, usually be

obtained through the courtesy of the examiners.

In making searches at the patent office at Washington, not only does the searcher have available the classified U. S. patents, but he has access to the files of U. S. patents, containing the various patent office proceedings, leading up to their grant, including the original application papers and amendments thereto, and the official communications of the examiners who examined the application, in which are referred to the prior patents and publications which the examiners found upon their search and considered relevant to the invention sought to be patented. By examining the files of U. S. patents which are of nearest subject-matter to the investigation in question, it may be possible to obtain reference to prior patents or publications which are of particular interest, and which would not be readily available otherwise.

A further value of the patented files is the indication thereon of the classification of the respective patents, and the indication in the various official actions of the classification of the prior patents which are referred to therein. Attention may thus be directed not only to prior patents of relevant subject-matter, but even to other classes of the patent office which might

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

otherwise have been overlooked, but which may contain patents of interest. The number of classes and sub-classes of patents is so great, and the classification of patents is in many instances so complex, that relevant classes or sub-classes may well be overlooked unless special precautions are taken to insure their proper consideration.

Likewise available at the patent office are the records of interference proceedings in which issued patents have been involved, which records, in some cases, contain lists of prior patents and publications relating to the same subject-matter as the patent, and in other cases contain testimony of interest in connection with the patented invention.

Valuable information may likewise be obtained from many of the court records of patent cases and even from the court decisions in such cases, inasmuch as a consideration of the question of patentability, in view of prior patents and publications, is almost always raised in such cases. Extended searches are usually made in connection with such litigation and the pertinent results thereof made a part of the record of the case. The testimony forming a part of court records may likewise contain valuable information.

Attempts to make comprehensive investigations of U. S. patents elsewhere than at the patent office are generally unsatisfactory. However, abstracts of U. S. patents, as well as of foreign patents, are published in Chemical Abstracts, classified in the same way as the other literature, and similarly indexed, and a search through this field is a useful check upon any search made at the patent office itself. Nevertheless experience has shown that a search through Chemical Abstracts, even during recent years, cannot be relied upon to disclose all patents of interest along any particular line, and, of course, the Abstracts only go back about a dozen years.

There has been no comprehensive list published of U. S. patents relating to chemistry.

A valuable digest of the older U. S. patents relating to chemical industry has been published in Census Bulletin No. 210, (Pub. 1902), but this list includes only patents granted prior to 1902, and hence only expired patents, and the bulletin is now out of print.

One of the few partial lists of U. S. patents that have been published appears in a German publication, viz., in Vol. 3 of Winther's "Patente der organischen

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

Chimie", (Pub. 1910). This list includes patents relating to organic chemistry granted between 1895 and 1908, with the number, date, patentee and title of the patent, and the number of the corresponding German patent, if any.

Another of the partial lists of U. S. patents published is that of patents granted to Germans and Austrians, compiled by the Federal Trade Commission as prima facie enemy owned patents. This list, or the part of it of more particular relation to chemistry, has been published by the "Oil, Paint and Drug Reporter" during the past year, and also appears in the "1918 Year Book" of that periodical.

A similar list of formerly enemy-owned patents, which have been taken over by the Alien Property Custodian and transferred to The Chemical Foundation, is contained in a "Temporary List" recently issued by The Chemical Foundation. A publication of abstracts of these patents, in classified form, is contemplated. This list includes about four thousand patents now in force, that is, granted during the past seventeen years.

All of these lists are at best but partial and incomplete, and unsatisfactory from the standpoint of making any comprehensive search.

British patents have been granted since 1617, and

2

— *Journal of the American Medical Association*, 1967, 201: 1001-1002.

as early as 1622 we find patents relating to chemical subjects, viz., the manufacture of soap and of white and red lead pigments. Prior to the year 1700 patents were also granted relating to various other chemical subjects, including alum, salt, pottery, the parting of silver from lead, saltpetre and various metallurgical processes.

The British patents are more generally accessible for purposes of search than the patents of any other country, for the reason that the British Patent Office has published classified abstracts or abridgments of all the patents which have been granted since the earliest days of the British Patent system^{and} up to within the last few years. Thus we find, in a single volume, digests or abridgments of British patents granted between 1622 and 1866 relating to "Acids, Alkalis, Oxides and Salts"; another volume containing digests or abridgments of British patents granted between 1617 and 1866 relating to "Oils, Fats, Lubricants, Candles and Soaps"; and so on.

Between the years 1855 and 1908 the classified British patents of each class have been published in nine successive volumes, each covering a period of a few years, so that, for example, the nine volumes of the

class relating to "Acids, Alkalis, Oxides, and Salts, Inorganic", will contain abstracts or abridgments of the British patents of this class, granted during this period. A similar series of nine volumes contains abstracts or abridgments relating to Organic Chemistry, and the same is true of metallurgy and other various classes into which the British patents are officially classified. The classified abridgments since 1908 are being published a few pages at a time.

In addition, fifty year subject-matter indexes of the classified British patents have been published for each class, covering the period from 1861 to 1910.

A complete set of German patents is available at the patent office in Washington, and, in addition, a classified set of German patents for recent years, classified according to the German classification. A search of German patents can accordingly be much more readily conducted at Washington than elsewhere.

However, many of the German patents are abstracted in the German abstract and review periodicals, and, in addition, many compilations of German patents, relating to different subjects, have been published. Notable among these is the work by Friedlander, relating to dyestuffs. This work, which has been issued in eleven

parts and which covers the period from 1877 to 1914, give a very complete and classified review of the German patent literature relating to organic dyestuffs.

A similar work is the three volume work by Winther, "Patents der Organischen Chemie." This work is not so well known as Friedlander, but it is in some respects more accessible for search purposes. The first volume contains abstracts or digests of the German patents and applications between 1877 and 1905, relating to organic compounds other than dyestuffs. These are classified according to subject-matter; for example, hydrocarbons, alcohols, ketones, alkaloids, photographic developers, etc.

Vol. II contains abstracts or digests of German patents relating to organic dyestuffs within the same period, 1857 to 1905, and these patents are classified according to classes; for example, sulphur dyes, indigo dyes, azo dyes, etc.

The third volume, published in 1910, is the index volume, and contains several different indexes, including a numerical list of German patents, with the corresponding United States, English, French, Austrian and Russian patents, if any; also a list of United States patents between 1895 and 1908 with the number, date, patentee and title of the invention and the corresponding

German patents, if any. Similar lists are given of the British, French, Austrian and Russian patents, with the corresponding German patents, if any. The volume also contains a list of patentees with the patents of each patentee and of each company classified by subjects. The volume includes finally a subject-matter index of the various organic compounds, intermediates, etc., with reference to the volume and page of the first two volumes of the work where they will be described.

A useful list of trade names of chemical compositions and products of various kinds is also included in this same volume (Winther, Vol. 3), with indication of the chemical composition, manufacturer, and the patent or literature citation where a description of the substance will be found.

The patents of some of the other foreign countries, including France, Austria, Switzerland, Denmark, Norway and Sweden, are likewise available, in classified and bound form, at the patent office library, and for this reason, are more readily searched there than elsewhere.

In addition to the foreign patents available at the patent office library, duplicate sets of patents of several foreign countries are accessible in the examining divisions, classified the same as the U. S. patents,

and may be there examined with the examiner's permission.

The patents of some foreign countries are not available even at the patent office, particularly of those countries which do not publish their patents. Copies of such patents are usually obtainable only in manuscript form from the patent offices of these respective countries. Information regarding such patents may, however, be obtainable through the official patent office publications. Thus, Canadian patents are not published, but the patent claims are published in the "Patent Office Record".

Frequently the same invention will be found patented in several different countries, and will be found abstracted or reviewed in the current literature. Again, the inventor may publish a full account of his work in addition to the particular part which he patents. Accordingly, when a patent is discovered which is of particular interest, it is sometimes profitable to see whether the same inventor has taken out patents in other countries, or has published other descriptions of his work at about the same time, from which still further information is obtainable.

If reference is found to foreign patents which were not published, or which are not available, it may, nevertheless, be possible to find a corresponding patent

1. The first part of the report is a general introduction to the subject of the study. It discusses the importance of the study and the objectives of the research. It also mentions the scope of the study and the limitations of the research.

2. The second part of the report is a literature review. It discusses the previous studies on the subject of the study. It mentions the findings of the previous studies and the gaps in the knowledge.

3. The third part of the report is a description of the research methodology. It discusses the research design, the data collection methods, and the data analysis methods.

4. The fourth part of the report is a presentation of the research findings. It discusses the results of the study and the conclusions drawn from the findings.

5. The fifth part of the report is a discussion of the research findings. It discusses the implications of the findings and the limitations of the study.

6. The sixth part of the report is a conclusion. It summarizes the main findings of the study and the conclusions drawn from the research.

7. The seventh part of the report is a list of references. It lists the sources of the information used in the study.

8. The eighth part of the report is an appendix. It contains the raw data and the calculations used in the study.

9. The ninth part of the report is a list of figures and tables. It lists the figures and tables used in the study.

10. The tenth part of the report is a list of abbreviations. It lists the abbreviations used in the study.

11. The eleventh part of the report is a list of symbols. It lists the symbols used in the study.

12. The twelfth part of the report is a list of footnotes. It lists the footnotes used in the study.

13. The thirteenth part of the report is a list of appendices. It lists the appendices used in the study.

14. The fourteenth part of the report is a list of references. It lists the sources of the information used in the study.

15. The fifteenth part of the report is an appendix. It contains the raw data and the calculations used in the study.

16. The sixteenth part of the report is a list of figures and tables. It lists the figures and tables used in the study.

17. The seventeenth part of the report is a list of abbreviations. It lists the abbreviations used in the study.

18. The eighteenth part of the report is a list of symbols. It lists the symbols used in the study.

19. The nineteenth part of the report is a list of footnotes. It lists the footnotes used in the study.

20. The twentieth part of the report is a list of appendices. It lists the appendices used in the study.

granted in another country, if there is any, or find further information about the particular patent or invention from the contemporaneous periodical literature.

OBTAINING COPIES OF PUBLICATIONS AND PATENTS

The obtaining of copies of articles appearing in publications, as well as copies of foreign patents, has been very materially facilitated by photographic processes of reproduction, which have been installed by many of the leading libraries. It is thus possible to obtain copies of one or more pages of publications or patents contained in the libraries, where copies of the publications or patents themselves are not obtainable, or are obtainable only at increased expense or with inconvenience and delay.

Among the libraries which will thus furnish photographic copies are the Patent Office at Washington, the Engineering, Chemists' Club and Public Libraries of New York, and the John Crerar Library of Chicago.

IMPORTANCE OF PROVIDING BETTER FACILITIES FOR INVESTIGATING AND USING THE CHEMICAL LITERATURE

The importance of providing better facilities for making use of the chemical literature is well set forth in the following extract from the "Report of the Commit-

tee on Publication of Compendia of Chemical Literature, etc.", appearing in the "Journal of Industrial and Engineering Chemistry" for May, 1919, pages 415-417:

"The committee recommends cordial and effective co-operation in suitable ways by the American Chemical Society and other American scientific and technological bodies with the efforts of the chemists of Great Britain to organize the work of publication in English of compendia of chemical literature, and to encourage the production of chemical literature in English.

"In presenting the whole problem of the organization of compendia, monographs, etc., in English by the British as well as by ourselves, the committee would urge that the question be considered from the point of view of national (cultural) importance as well as from that of scientific utility. The almost exclusive use of German compendia and monographs in all countries has given the German scientists an influence in foreign countries (from China to Argentine, Spain and Russia, and all lands between these countries) entirely out of proportion to their real share in scientific productiveness--leading to the migration of foreigners to Germany for their advanced studies, with resultant serious influences, political, commercial and cultural, in these countries. We must recall, too, that in their compendia and monographs, German chemists have been wont to ignore to a certain large extent, or to underrate, the work done in other countries, especially perhaps that done in the United States."

The compilation of compendia of chemical literature requires extensive investigation of the literature by the compilers. The production of monographs of value likewise requires investigation of the literature by the producers. Such investigations necessarily involve

the use of library facilities, and must be made by investigators trained and experienced in making such investigations. Accordingly, if the compilation of compendia, and the production of chemical literature in English, are to become at all general, and if proper use and investigations of the literature are to be made in connection therewith, it is important for American chemists to be properly trained in the use of the chemical literature as it now exists, and in the existing facilities for its investigation.

TRAINING IN THE USE OF CHEMICAL LITERATURE

Adequate training in the use of the chemical literature is not as general as it should be, nor does its importance seem to be generally recognized. The proper use and investigation of the chemical literature necessarily involves the use of library facilities, and familiarity therewith, yet we find no text-book or manual dealing with the subject, comparable to the many laboratory manuals which deal with the use of laboratory facilities.

A discussion of the extent to which training in the use of chemical literature is given in a number of American technical schools and universities is given in an excellent paper on "Chemical Literature and its Use", by

the use of library facilities, and must be made
- investigators trained and experienced in the use of
- investigations. Accordingly, it is recommended that
- the use of library facilities, and the production of the local
- facilities, and the production of the local facilities, and the
- use and investigation of the local facilities, and the
- collection facilities, is in the use of the local facilities
- to be properly trained in the use of the local facilities
- and is now being, and in the existing facilities, and in

Miss Marion E. Sparks of the University of Illinois, appearing in "Science" for April 19, 1918, pages 377-381. In this paper Miss Sparks also describes the Journal-Library Course given to students in the chemical and chemical engineering courses at the University of Illinois. This paper is much less complete, however, than the lecture notes used in the course, which outline the entire subject in a comprehensive manner. It is to be regretted that these lecture notes have not been published and made available for use in other colleges and universities, and to chemists generally. There is a real need for a comprehensive publication of this character.

There is likewise need of a more general appreciation, among American chemists and among American colleges, technical schools and universities, of the importance of proper use of the chemical literature, and of more general training in its use. "Library" courses, as well as "laboratory" courses, should be included in every college and university course in chemistry and chemical engineering.

* * * * *





